

## I CLAIM:

1. A commercial ice making method for producing commercial ice in convenient sizes for at least one of mobile food carts, market produce, or fish displays comprising the steps of:

5       introducing water into hollow walls of an elongated mold in an ice forming freezing tray oriented substantially horizontal said hollow walls comprising an inner, circular wall into which said water is introduced and an outer, circular wall spaced from said inner wall forming an arcuate shaped passageway extending  
10       the length of said mold, said mold having dividers in said inner wall forming separate ice forming compartments;

      passing refrigerant through said arcuate shaped passageway to supercool water in said compartments forming ice segments to a temperature below 0 degrees F;

15       rapidly subjecting said supercooled ice segments to a short, temporary contact with a high heat source by momentarily passing a heated fluid through said passageway to melt a thin layer of ice adjacent said inner wall;

      bypassing said refrigerant in a by pass pipe and exposing  
20       said refrigerant to said heated fluid in an adjacent portion of said passageway,

      rotating said tray containing said ice segments to a substantially vertically oriented dump position whereby said ice segments are dumped from said mold into a collection bin.

25       2. The method as in Claim 1 wherein said arcuate passageway is crescent-shaped.

      3. The method as in Claim 1 wherein said arcuate shaped passageway comprises a pair of arcuate, spaced apart parallel walls connected by connecting walls therebetween.

30       4. The commercial ice making method as in Claim 1 in which exposure to said high heat source is carried out by reversibly cycling said refrigerant thereby creating said thin layer of water lubricating and dislodging said ice segments while said tray is in a vertical dumping position, said thin liquid

interface layer quickly refreezing upon said dumped ice cube segments being dumped into said collection bin due to the supercooled temperature of said ice segments.

5        5. The commercial ice making method as in Claim 1 wherein said tray is tipped slightly during filling of said mold with water whereby excess water after said mold compartments are filled flows over a lower end of said mold into a trough, said tray being righted into a horizontal position after said compartments are filled with water for freezing, all of the water  
10        for said mold coming from a dispenser located adjacent a higher end of said mold

6. The commercial ice making method as in Claim 1 wherein rotating of said freezing tray is facilitated by the use of loops of flexible refrigerant hoses.

15        7. The commercial ice making method as in Claim 6 wherein in a freeze cycle said liquid refrigerant flows through an expansion valve into said passageway, whereupon said refrigerant evaporates by extracting heat from said water thereby freezing said water into said ice segments, whereby further said refrigerant flows to  
20        a heat exchanger acting as a condenser with said liquid refrigerant flowing therethrough.

8. The commercial ice making method as in Claim 7 wherein said liquid refrigerant flows through said expansion valve into said heat exchanger acting as an evaporator extracting heat from  
25        ambient air to vaporize said liquid refrigerant, wherein suction is applied to said vaporized refrigerant from said heat exchanger to a compressor and onward to said passageway, which said freezing tray is subject to said temporary high heat source through said passageway and said freezing tray acts as a  
30        condenser giving up heat to temporarily melt bottom surfaces of said ice segments.

9. The commercial ice making method as in Claim 8 wherein use of said crescent shaped passageway in intimate contact with said freezing tray promotes rapid heat transfer, causing short

ice batch formation cycles thereby providing high throughput of said ice segments.

10. A commercial ice making apparatus for producing commercial ice in convenient sizes for at least one of mobile food carts, market produce, or fish displays comprising:

a substantially horizontal freezing tray comprising rows of elongated molds;

each mold comprising an upper curved wall extending the length of said mold forming an upwardly facing concave surface divided into compartments by a plurality of spaced separators and a lower curved wall forming a crescent shaped passageway through the length of said mold, said upper and lower curved walls being joined at edges thereof;

an inlet introducing water into said molds;

means for introducing vapor compression refrigerant into one end of each passageway for making intimate contact with said compartments to produce a plurality of ice segments in said compartments;

said refrigerant adapted to supercool said ice segments to a temperature below 0 degrees F.

11. The method as in Claim 10 wherein said arcuate passageway is crescent-shaped.

12. The method as in Claim 10 wherein said arcuate shaped passageway comprises a pair of arcuate, spaced apart parallel walls connected by connecting walls therebetween.

13. The commercial ice making apparatus as in Claim 10 further comprising a timer rapidly subjecting said supercooled ice segments to a short, temporary contact with a high heat source in said passageway.

14. The commercial ice making apparatus as in Claim 11 further comprising a rotator for rotating said freezing tray containing said at least one batch of ice segments about said horizontally oriented, longitudinally extending axis, to a vertically oriented dump position for dumping said temporarily

heated ice segments from said freezing tray into a collection bin.

15. The commercial ice making apparatus as in Claim 14 further comprising a reversible cycle heat pump alternately  
5 cycling said refrigerant and said high heat source into said passageway for a brief thaw cycle, thereby creating a thin layer of water at an interface between said ice segments and a surface of said freezing tray, thereby lubricating and dislodging said ice segments while said tray is in a vertical dumping position,  
10 said thin liquid layer quickly refreezing upon said dumped ice cube segments being dumped due to the supercooled temperature of said ice segments.

16. The commercial ice making apparatus as in Claim 10 wherein said water inlet source is removable away from said  
15 horizontal freezing tray, exposing said freezing tray for display of objects thereon.

17. The commercial ice making apparatus as in Claim 16 further comprising said compartments of said freezing tray being shallow with an increased a radius of arc of said compartments  
20 and a decreased a vertical height thereof.

18. The commercial ice making apparatus as in Claim 13 wherein in a freeze cycle said refrigerant is a liquid which flows through an expansion valve into said freezing tray, whereupon said refrigerant evaporates by extracting heat from  
25 said water thereby freezing said water into said ice segments, whereby further said refrigerant flows to a heat exchanger acting as a condenser with said liquid refrigerant flowing therethrough.

19. The commercial ice making method as in Claim 18 wherein said liquid refrigerant flows through an expansion valve into  
30 said heat exchanger acting as an evaporator extracting heat from ambient air to vaporize said liquid refrigerant, wherein suction is applied to said vaporized refrigerant from said heat exchanger to a compressor and onward to said passageway, which said freezing tray is subject to said temporary high heat source

through said passageway and said freezing tray acts as a condenser giving up heat to temporarily melt said bottom surfaces of said ice segments.

20. The commercial ice-making machine as in Claim 18 wherein  
5 at least one non-metallic spacer with sub-compartments is inserted into said compartments prior to entry of water thereto.

21. The commercial ice making machine of claim 10 having means to slightly tilt said freezing tray during filling of said compartments with water, a trough being positioned to collect  
10 surplus water after said compartments are filled with water, said tilt means rotating said freezing tray to a horizontal position for freezing of water in said compartments after said compartments are filled with water.

22. The method of producing salt-containing segments of ice  
15 in which the salt is substantially uniformly distributed throughout the ice segments comprising the steps of:

pouring water containing salt into a horizontal mold divided into separate ice forming compartments;

chilling said mold while in a horizontal position at a  
20 sufficient rate of cooling to prevent desalination of the water in said mold and produce a single solid segment of ice in each compartment; and

continuing said chilling until the temperature of the ice in said mold is between minus 10° F and minus 50° F thereby  
25 producing supercooled segments of ice.

23. The method of claim 22 in which said segments of ice are removed by rapidly subjecting said supercooled ice segments to a short, temporary contact with a high heat source to melt a thin layer of ice adjacent walls of said mold and rotating said mold  
30 to a substantially vertically oriented dump position whereby said segments of ice are dumped from said mold into a collection bin.

24. The method of claim 22 in which said water containing salt is seawater.

25. The method of claim 22 in which said water contains salt

in the amount of about 3% by weight of salt content.

26. The method of claim 22 in which chilling is at the rate of about twenty to thirty minutes time duration.

27. The method of claim 22 in which wherein said mold is  
5 tipped slightly during filling to discharge excess water into a trough, said mold being righted back into a horizontal position after said compartments are filled with salt water for freezing.

28. The method of claim 22 in which said mold comprises an upper curved wall extending the length of said mold forming an  
10 upwardly facing concave surface divided into said compartments by a plurality of spaced separators and a lower curved wall forming an arcuate shaped passageway through the length of said mold, said upper and lower curved walls being joined at edges thereof.

29. Supercooled segments of ice containing salt produced by  
15 the method of claim 22.

30. Supercooled segments of ice containing salt made by the process of:

pouring water containing salt into a horizontal mold divided into separate ice forming compartments;

20 chilling said mold while in a horizontal position at a sufficient rate of cooling to prevent desalination of the water in said mold and produce a single solid segment of ice in each compartment; and

continuing said chilling until the temperature of the  
25 ice in said mold is between minus 10° F and minus 50° F thereby producing supercooled segments of ice.

31. The supercooled segments of ice of claim 30 in which the salt content of said segments is about 2.7% by weight.

32. The supercooled segments of ice of claim 30 in which the  
30 salt content of said segments is in the range of about 2% to 4% by weight.

33. The supercooled segments of ice of claim 30 in which said water is sea water.

34. The method of producing beverage containing segments of

ice in which non-water components are substantially uniformly distributed throughout the ice segments comprising the steps of:

pouring water containing beverage components into a horizontal mold divided into separate ice forming compartments;

5 chilling said mold while in a horizontal position at a sufficient rate of cooling to prevent separation of the water in said mold and produce a single solid segment of ice in each compartment; and

continuing said chilling until the temperature of the  
10 ice in said mold is between minus 10° F and minus 50° F thereby producing supercooled segments of ice.

35. The method of claim 34 in which said segments of ice are removed by rapidly subjecting said supercooled ice segments to a short, temporary contact with a high heat source to melt a thin  
15 layer of ice adjacent walls of said mold and rotating said mold to a substantially vertically oriented dump position whereby said segments of ice are dumped from said mold into a collection bin.

36. The method of claim 34 in which said water containing beverage is a carbonated beverage.

20 37. The method of claim 34 in which said water containing beverage is an alcoholic beverage.

38. The method of claim 34 in which said water containing beverage is a beer beverage.

25 39. The method of claim 34 in which said water containing beverage is a wine beverage.

40. The method of claim 34 in which said water containing beverage is juice.

41. The method of claim 34 in which wherein said mold is tipped slightly during filling to discharge excess water into a  
30 trough, said mold being righted back into a horizontal position after said compartments are filled with beverage water for freezing.

42. The method of claim 34 in which said mold comprises an upper curved wall extending the length of said mold forming an

upwardly facing concave surface divided into said compartments by a plurality of spaced separators and a lower curved wall forming an arcuate shaped passageway through the length of said mold, said upper and lower curved walls being joined at edges thereof.

5 43. Supercooled segments of ice containing a beverage produced by the method of claim 34.

44. Supercooled segments of ice containing a beverage made by the process of:

10 pouring water containing a beverage into a horizontal mold divided into separate ice forming compartments;

chilling said mold while in a horizontal position at a sufficient rate of cooling to prevent desalination of the water in said mold and produce a single solid segment of ice in each compartment; and

15 continuing said chilling until the temperature of the ice in said mold is between minus 10° F and minus 50° F thereby producing supercooled segments of ice.

44. A commercial ice making method for producing commercial ice in convenient sizes for at least one of mobile food carts, market produce, or fish displays comprising the steps of:

20 introducing water into hollow walls of an elongated mold in an ice forming freezing tray oriented substantially horizontal said hollow walls comprising an inner, circular wall into which said water is introduced and an outer, circular wall spaced from said inner wall forming an arcuate shaped passageway extending the length of said mold, said mold having dividers in said inner wall forming separate ice forming compartments;

25 passing refrigerant through said arcuate shaped passageway to supercool water in said compartments forming ice segments to a temperature below 0 degrees F;

30 rapidly subjecting said supercooled ice segments to a short, temporary contact with a high heat source by momentarily passing a heated fluid through said passageway to melt a thin layer of ice adjacent said inner wall;



rotating said tray containing said ice segments to a substantially vertically oriented dump position whereby said ice segments are dumped from said mold into a collection bin;

wherein said arcuate shaped passageway comprises a pair of  
5 arcuate, spaced apart parallel walls connected by connecting walls therebetween.

45. The commercial ice making apparatus as in Claim 10 wherein said apparatus is deployed upon a boat and said water is seawater.